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19 December 1991

Office of the Secretary
Federal Communications Commission
1919 M Street
Washington, DC 20554

In the Matter of
Advanced Television Systems
and Their Impact Upon the
Existing Television Broadcast
Service

MM Docket No. 87-268

Dear Commissioners,

Kindly find enclosed fifteen (15) copies of my comments to MM Docket Number 87-268 in response to the Notice of Proposed Rulemaking which was adopted Oct 24, 1991, released November 8, 1991, a comment date of 20 December 1991, and with a reply comment date of 20 January, 1992.

I had previously sent 10 copies which you should have received 17 December 1991. However, on those copies, I had incorrectly listed the docket number to be the same as the Zip code. I have therefore enclosed these copies with this typographical error corrected.

Also, I would appreciate three copies each being delivered to Chariman Sikes, as well as to Commissioners Barrett, Duggan, Marshall, and Quello.

Your cooperation is greatly appreciated,

Sincerely,

Gary Demos
President/CEO

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13 December 1991

Before the
Federal Communications Commission
1919 M Street
Washington, DC 20554

In the Matter of
Advanced Television Systems
and Their Impact Upon the
Existing Television Broadcast
Service

MM Docket No. 87-268

COMMENTS OF

Gary Demos
President/CEO
DemoGraFX
(A California Corporation
And Small Business)

These comments are directed to Paragraph 47: Compatibility with Other Media.

I wish to recommend that the FCC give the strongest possiblez support to the concepts of Interoperability, Extensibility, and Scalability, as applied to Advanced Television formats.

First, I wish to compliment the FCC on having stimulated the development of digital Advanced Television. Clearly there has been a great deal of excitement about the quality and potential for all-digital Advanced Television formats.

However, the new digital formats all ocurred mid-process in the selection of an Advanced Television format suitable for terrestrial broadcast. Thus, it may have been challenging to adjust the ongoing ATTC and ACATS processes to be appropriate for these developments.

It appears to me, from outside the process, that an excellent attempt is being made to update the testing processes to the new realities of the digital imaging world in advanced television. However, I would like to see additional budget applied to testing those aspects of the digital Advanced Television systems which were not anticipated when the testing process was initially set up.

To that end, I would like to suggest that the following issues be examined by somewhat expanding the scope of the testing process through increased funding, without lengthening the time lines of the process.

1) We would all like to see the very best Advanced Television system developed for the United States. To that end, it would be most optimal if all good ideas in each and every system being tested are able to be combined into the final system for the United States. The areas which might be involved could fall in each of the major portions of the system. These portions may be separable in some of the systems, and thus could potentially be combined with other portions from other proposed systems which might be more optimal. The major areas which could be factored separately in the testing process might include:

a) The audio encoding, compression, and error protection

b) The image compression technology

c) Layered, prioritized packetization schemes

e) The motion vector representation and techniques

f) The imagery error protection and data order formatting

g) The ancillary data area format

h) The broadcasting modulation technique

i) The picture rate

j) The scanning structure format

2) Much of the quality of the systems being tested is due to the specific resolutions and rates in the formats. However, most of the systems can be applied to alternative formats, including formats not currently being tested. It would be valuable if the image structure, that is number of pixels and number of scanlines, could be left more open and flexible than the small number of formats being currently evaluated. There may be other formats which are desirable, which might exhibit better quality for certainly widely-needed applications, which would also be beneficial to consider for Advanced Television.

3) Some of the systems being tested send movies, which operate at 24 frames per second, in a different format from live camera images. These formats before the FCC apparently update the image as a progressively scanned format of 24 Hz. However, none of the systems is currently testing the ability to display movies at rates other than 59.94 Hz, the live camera rate. The 59.94 Hz display rate requires use of the 3-2 pulldown, which has always been a weakness of NTSC.

It has been indicated that displays will be able to display movies at simpler multiples of 24 than 59.94 Hz with some of the formats being tested. It would be useful to actually test performance of those systems using a 24 frame per second update of the image on an active matrix flat panel or other devices which have no inherent flicker. For high brightness large displays, or displays viewed at close proximity such as computer workstations, it would be worthwhile to test standard Cathode Ray Tube performance displaying movies with refresh rates such as 72 Hz. This is three times the 24 frame per second movie rate. In Europe, 50 Hz interlaced PAL and SECAM are now being displayed on 100 Hz interlaced Cathode Ray Tube television receivers. It would also be useful to test a very similar format of 96 Hz interlaced display of 24 frame per second movies.

For interoperability with computer displays, some refresh rate in excess of 70 Hz is required. 59.94 Hz results in too much flicker when viewed under computer display viewing conditions.

4) It is an inherent property of digital Advanced Television systems that they contain memory for one or more frames at each receiver, which are used as part of the decompression process. The presence of these frame stores provides an inherent capability for the display refresh and flicker rate to be decoupled from the picture update rate. Further, future displays, such as active matrix flat panels and electroluminescent displays may exhibit no inherent flicker, and can therefore be updated at any rate having acceptable motion portrayal.

Further, it is an inherent capability of frame storage buffers to allow different portions of the screen to be updated with different rates and qualities. If only a narrator is moving over a still background image, then only the region of the picture where the narrator is seen need be updated rapidly.

These and other fundamental capabilities of digital Advanced Television systems can be utilized advantageously if capabilities are provided to allow access to them. To the degree that the digital Advanced Television systems are open to such flexibility of use, then greater channel efficiency, especially on shared channels, can result.

5) 59.94 Hz formats are very naturally related to NTSC, at the same rate, although the interlaced formats are still quite difficult to convert to NTSC. Those formats which use 59.94 Hz or 60 Hz interlace are potentially very problematic for interoperability with each of the following areas:

a) 24 frame per second movie release on film, for material produced in interlaced formats

b) Display on computer workstation displays, which cannot use interlace

c) Display of still images with fine details such as magazine and newspaper pages, technical journal pages, encyclopedia pages, technical drawings, catalogs, fax pages, etc.

d) NTSC down conversion, because of the requirement for a motion predictive de-interlacer as part of the down conversion process, since the lines are present at the wrong times

e) 59.94 Hz video formats, and particularly interlaced formats, have been difficult to use for the editing process with motion picture films

f) Such formats are difficult to convert to other HDTV or high resolution film production formats.

6) The compression algorithms used in the Advanced Television systems essentially compress a certain number of pixels each second. The corresponding resolution of 59.94 Hz imagery must therefore be lower than the corresponding potentially higher resolution of 24 frame per second movies. Some of the proposed systems have the capability to provide higher resolution for 24 frame per second movies than for 59.94 Hz sports or other live camera or tape coverage. However, this capability is not being utilized in any of the systems currently, and is not being tested. It would possible to have improved quality for 24 frame per second movies over 59.94 Hz or other higher rate imagery, by exposing this inherent higher resolution film capability within some of these systems. It would be desirable if this capability could be examined in some of the proposed systems, as well as being investigated as part of the testing process.

7) Film production systems are being developed in the motion picture industry by a number of companies including Kodak, as well as by my company in conjunction with Pacific Title and Art Studios in Hollywood. These systems use formats known as "electronic intermediate" or "digital mastering formats". The systems are intended to operate slower than full speed (non-real time) in order to produce special effects in the making of motion pictures. These systems nearly all use a horizontal resolution of 4096 pixels or near to this, which is substantially higher than the resolutions of the Advanced Television proposals. Compatibility with these digital formats should be investigated, since such formats are likely to be a precursor to future real time Advanced Television formats. Also, imagery produced in these high resolution formats will potentially be used as source imagery for Advanced Television.

It would be helpful to the acceptance and use of Advanced Television formats if they were to be compatible with industry production formats currently under development. The issues with respect to production for Advanced Television should be considered, since production difficulties with a given format or system might delay acceptance and use because of potentially reduced availability of programming.

8) Advanced Television was initially viewed by many as almost exclusively an entertainment and news medium, similar to NTSC. However, it is becoming clear that this represents a very shot-sighted view. Advanced Television is potentially capable of substantial use in important areas such as education, medicine, science, and the office. Part of this additional use stems from the ability of Advanced Television screens to display text and images such as newspapers, magazines, documents, photographs, drawings and diagrams, and many other still images.

This is a substantial difference from current television systems such as NTSC, PAL, and SECAM, which are not capable of displaying a normal still page of text, pictures, or drawings. Since this capability is potentially very important to our daily work and our personal lives, it would be worthwhile if the Advanced Television systems were fully tested for their capabilities in displaying still frames. Each system's potential ability to display typically computer images, such as word processing, spread sheet, and other useful displays, might also be worthwhile to test.

9) The current proposals are primarily related to the NTSC format. PAL and SECAM format conversions would have varying degrees of difficulty during conversion. Further, there are international HDTV standards being explored which may be quite incompatible with the current Advanced Television proposals before the FCC. An investigation of international format conversion compatibility, especially with PAL, would be useful to investigate and test.

By way of example, the potential market opportunities for a U.S. producer of a documentary, when produced in one of the Advanced Television formats, may be limited to broadcast and home video tape rental. However, it would be desirable to be able to find additional easily accessed markets in the areas of theatrical film release, computer multi-media educational systems, book or magazine publication from the images, and international television and high definition television release. The usefulness of Advanced Television formats for each of these potential distribution areas would be worth investigating and testing.

The United States has a trade surplus in the show production industry. This industry is aided if international distribution is eased by attention to reducing format conversion barriers.

10) It is possible that some of the material which is shown on future Advanced Television systems may be produced in other high resolution formats. There is a serious danger that the conversion process between such other formats may interact detrimentally with the quality of the Advanced Television systems under investigation. It therefore seems worthwhile to test the performance of these Advanced Television systems when they are applied to imagery which has been converted from other high resolution formats. Both the image resolution and the stability of the motion vectors used in compression in Advanced Television systems may be affected.

11) Much of the potential benefit to society from Advanced Television will be enabled if a national network is developed. The non-broadcast uses, where individuals can interact with colleagues at work, and family and friends, will involve the development of a national data communications infrastructure. Data exchange techniques on national networks are being investigated such as Broadband Integrated Services Data Network (B-ISDN), Asynchronous Transfer Mode (ATM), Synchronous Optical Network (SONET), Fiber Digital Interconnect Follow-On (FDDI-Follow-On), and Fiber Channel Standard (FCS). Some of these techniques support real time interactive exchange of moving picture and audio information.

Since this is such an important area for the future of the nation, it would be useful to test the coding and picture formats of the Advanced Television systems for compatibility and interoperability with these potential future networks. The National Gigabit Testbed, National Research and Education Network (NREN), and possibly future network provisions in the High Performance Computing Initiative Bill (HPCI), will potentially assist in building this crucial national infrastructure.

In this particular area, it is critical that current regulatory barriers, vested political interests, and minor technical and budget hurdles not interfere with a coordinated national development, both private and government. Interpersonal work productivity, research, and education, to name a very few important areas, would all potentially greatly benefit from such a network. Such areas could contribute substantially to individual productivity, and ultimately to the Gross National Product. This is particularly true for those regions of the country where improved communications might enable jobs and education that would otherwise not be available.

12) With the extremely rapid pace of technology, it is very unlikely that any level of quality will remain the standard for long. The NTSC durability of 40 years will not be repeated in Advanced Television. Thus, in order for Advanced Television systems and formats to survive and continue to be useful for many decades, the system must be extensible with new technology. Open pathways to future improvements must be provided initially.

The work on a Universal Header/Descriptor taking place within the Society of Motion Picture and Television Engineers (SMPTE), is expected to be helpful in supporting both extensibility and flexibility. However, format and system issues are also involved in extensibility, and such attributes should be considered when examining Advanced Television proposals.

13) Because Advanced Television displays and components will ultimately be produced in large volumes, the economies of scale can potentially benefit many industries. Since the prices of Advanced Television will initially be moderately high, it is important to provide as much capability as possible in order to be as useful as possible in order to justify the cost. In both of these economic considerations the maximum benefit is derived for all industries and users if the Advanced Television systems support the broadest range of uses.

14) A scalable layered compression coding technique would be worthwhile in supporting reduced cost displays which have quality below full Advanced Television, but possibly better than NTSC. Although none of the current proposals has yet demonstrated this capability, it may be an inherent capability within the compression techniques, if adjusted properly. Further, scalable compression techniques and scalable picture formats are also helpful for extensibility in providing higher quality future resolutions and temporal rates. Scalability properties could be investigated for various of the compression schemes being considered, and possibly scalable decodings could be tested.

15) In addition to scalable quality levels from a single format, scalability in bandwidth is also a useful system property. Although the current Advanced Television digital systems are primarily 20 Mbit/second proposals within 6 MHz, it is possible that both wider and narrower channels will be available. For example, cable television systems, direct broadcast satellite, and fiber distribution are all very viable.

The FCC process, although it has focused on terrestrial broadcasting, has become an enabling focus for the development of digital Advanced Television technology. The momentum of this focus should be extended, if possible, to other delivery media and channels, with differing bandwidths. Possible digital rates which might be found useful could include 45 Mbits/second and multiples thereof, as well as wider bandwidths than 6 MHz. Further, the ability to share a channel, using a continuously varying bandwidth to achieve a constant quality of image with changing scenes is potentially useful. This differs from the current proposals which exhibit varying quality of image as scenes change in their contant by using a constant bit rate at 6 MHz.

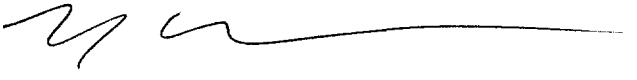
If the resolution, temporal rate, and compression format are scalable, then these higher bandwidth channels could be part of a natural scaled hierarchy, with a common signal for all. It would be useful if the testing process could consider such issues. Each such bandwidth and channel format, with different error and noise properties as well as bandwidth, should have as optimal a format as possible. However, the overall consideration of supporting each format as optimally as possible within a compatible framework may be more important than optimizing a single delivery channel. Clearly, political and vested interests from each distribution industry will insist that their particular channel should be optimized in format more than others. It will therefore naturally be incumbent on the FCC to ensure that the overall system is optimized without providing undue format problems for any particular delivery vehicle. The price of separately optimized schemes is potentially a substantial loss of quality when using a signal constructed for one medium on a different medium. Further, there may be substantial cost in conversion between different representations and formats. Thus, it is worthwhile to consider a complete overall system which supports all delivery media, at bandwidth and quality levels appropriate to each. It would be useful to give weight to this issue in the testing and evaluation considerations for Advanced Television systems.

Conclusion

I would like to see the FCC process continue on course as rapidly as possible. Indeed, there is comfort in having a known schedule and known goals. However, I would also like to see the testing process expanded, via increased budget and possibly other agency involvement, to include the crucial issues discussed here.

I certainly congratulate the FCC on having put more focus and direction to Advanced Television than any other nation. Further, the FCC has my utmost congratulations and gratitude for having stimulated the development of digital Advanced Television technology. Now that the process is heading in the right general direction, it is my hope that the final adjustments can be made to maximize the potential benefits of these accomplishments. It is my feeling that the adjustments discussed here, although they sound formidable, are really small in comparison to what has been achieved already in these digital systems. I want to encourage you to focus strongly on the issues of interoperability, scalability, and extensibility, to achieve the maximum benefit potential for Advanced Television.

Respectfully submitted,



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